

CASE REPORT

Management of Exposed Cochlear Implants: A Report of Two Cases

Vasanthi Anand¹, Sandhya Balasubramanyan², Lakshmi Shantharam³

ABSTRACT

Aim: There are several major and minor complications experienced by cochlear implant surgeons. Skin flap complication leading to exposure of the device is a major complication and can lead to explantation. In this article, we discuss about two cases where the implants were exposed, and the devices were successfully covered by flap rotation surgery.

Background: Two patients experienced major skin flap complication (MSFC) after a trauma and followed by local site hematoma. The receiver stimulator was exposed. The infection was controlled. The exposed receiver-stimulator was covered with temporalis facial flap and scalp rotation.

Case description: Case 1: The child had undergone cochlear implantation 2 years prior to presentation. The child had a head injury while playing that resulted in hematoma. It later got infected resulting in wound dehiscence and exposure of the device. Case 2: This implantee developed a small abscess near receiver stimulator 2 months after the surgery. Flap necrosis led to the device getting exposed. In both the cases, double layer of temporalis fascia and skin flap rotation surgery was done.

Conclusion: MSFCs can lead to exposed device. The device can be salvaged by two layers of vascularized temporalis fascia with skin flap. This way it is possible to save the device avoiding explantation.

Clinical significance: Every cochlear implant surgeon must know how to handle complications. The temporalis fascial graft is a good workhorse for covering the exposed device.

Keywords: Cochlear implantation, Device exposure, Major complication, Temporalis fascial flap.

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BACKGROUND

Cochlear Implantation is a life-changing procedure for a hearing-impaired person. The occurrence of a major complication threatening the device safety is emotionally and financially draining for the patient. The aim in such situations is always to save the implant function, avoiding explantation. One must note that the cost of the implant is very significant. Many recipients in India are economically weaker and have received implantation from Government schemes or with the help of philanthropies. Early identification of complications and prompt treatment is the key to save the device function.

The surgical technique used was Veria technique for cochlear implantation in all our cases. The Veria Operation is a non-mastoidectomy technique, which uses transcanal approach to middle ear, through a tunnel drilled in the postero-superior canal wall.¹ The electrode was inserted into the cochlea by cochleostomy or round window route.

Among 450 cases that we operated, we have seen minor and major complications. The minor complications were coil area redness, ulcer, otitis media, and vertigo. Most of them were resolved with minimal medical interventions. However, two had major skin flap complications (MSFCs) that developed due to trauma and local site infection, where the device was exposed. In this article, we report how the implant was salvaged by rotation flap surgeries. We aim to stress the importance of early intervention and the role of vascularized flap to salvage an exposed implant.

CASE DESCRIPTION

Case 1

A 4-year-old girl child having bilateral cochlear implants presented with injury to receiver stimulator area on the left side. She had

^{1,3}Department of ENT, Manasa Cochlear Implant Centre, Bhagavan Mahaveer Jain Hospital, Bengaluru, Karnataka, India

²Department of Plastic Surgery, Columbia Asia Hospitals, Bengaluru, Karnataka, India

Corresponding Author: Vasanthi Anand, Department of ENT, Manasa Cochlear Implant Centre, Bhagavan Mahaveer Jain Hospital, Bengaluru, Karnataka, India, Phone: +91 9900116499, e-mail: drvasanthianand@gmail.com

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undergone sequential bilateral cochlear implantation for congenital hearing loss. The left side was done first when she was 2 years old, followed by the right side. The child received postimplantation auditory verbal therapy and was doing well with good auditory benefits and speech.

The child developed head injury while playing that resulted in hematoma at the receiver stimulator area on the left side. It went unnoticed by parents due to the area hidden in the scalp hair. Few days later, she complained of pain at that area. On examination, there was a bulge with tenderness. The abscess was drained and she was given antibiotics. Local wound cleaning was done. Culture panel was studied, and targeted antibiotics were given with regular wound debridement. Infection control achieved, but the device was exposed through the gap in the wound (Fig. 1).

Double-layer closure of the implant with inner temporoparietal fascial flap and an outer scalp rotation flap was planned (Figs 2 and 3). The surgery was done during covid outbreak with all covid

precautions. The implant was well covered and antibiotics were given for 3 weeks postoperatively. Flap settled well; she was under follow-up for 1 year and surgical site has been stable.

Case 2

A 3-year-old boy from rural Karnataka underwent right cochlear implantation for congenital profound hearing loss. Two months after surgery and switch on, he presented with a small bulge with pain in the scalp. He could not visit the center immediately due to covid pandemic-related lockdown. He was prescribed antibiotics over telephonic consultation. He presented to us few days later with a bulge which was soft and yielding without pain. The pus in the bulge was released. The poor local hygiene was noteworthy. The culture showed Methicillin Resistant Staff Aureus which was sensitive to Inj. Vancomycin. He was admitted and treated with Inj. Vancomycin along with regular debridement of the wound. Once local infection control was achieved, primary closure of the wound was tried with advancement of skin. Few days later, there was wound gaping and implant was exposed. It was decided to do a rotation flap and close the exposed device.

Under general anesthesia, the wound area was debrided. Unhealthy and necrosed skin was removed till a healthy skin margin reached (Fig. 4). The area was irrigated with Injection gentamycin. A wide skin flap was planned to cover the area. Two-layer flap was obtained. The internal layer was temporalis fascia (Fig. 5). The external was skin with subcutaneous tissue. This flap was based on superficial temporal artery. The pulsations of the artery were checked. Two-layer rotation flap was covered on the exposed device (Fig. 6). Pressure dressing applied. The flaps healed well. He was on regular follow-up for 1 year with good device function.

There was no biofilm in both the above cases. Great care was taken to not disturb the device position or electrodes. Intra-op testing was done to check the device function.

Procedure

Temporoparietal fascia (TPF) is an extension of the SMAS layer (superficial musculoaponeurotic system) below, and Galea aponeurotica above. It is a well-vascularized flap based on superficial temporal vessels. The deep temporal fascia enveloping the temporalis muscle lies underneath TPF. The TP fascia is exposed by a skin incision anterior to the ear at the root of the helix. The incision can be a straight linear or lazy S- or Y-shaped



Fig. 1: Exposed receiver stimulator—Case 1

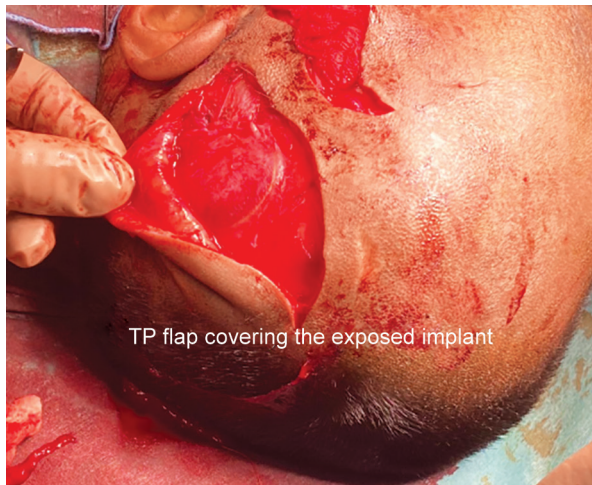


Fig. 2: Pedicled temporalis fascia harvested from one area rotated to cover the device—first layer—Case 1



Fig. 3: After two-layer closure—Case 1



Fig. 4: Exposed receiver stimulator—Case 2



Fig. 5: Temporalis fascia harvested and rotated to cover the exposed device—Case 2



Fig. 6: Two-layer closure done—Case 2

incision, based on the extent of exposure needed. Skin flaps were raised in the subfollicular plane with sharp dissection. The TP fascia with the blood supply is exposed. The fascial flap is dissected with its rich vascular plexus and transposed to the implant site and sutured with 3-0 vicryl. Next a rotation flap of healthy scalp tissue adjacent to the defect site is elevated and turned around to cover the scalp defect as a second layer and sutured.

DISCUSSION

Cochlear implantation (CI) is the standard treatment worldwide for people with severe-to-profound sensorineural hearing loss, where hearing aids have not benefitted. The indications for CI are expanding. Like any other surgeries, with increasing number of implantations, one is bound to see complications.

The complications in cochlear implant surgery can be major or minor. Major complications are complications requiring explantation of the device, surgical re-exploration, facial paresis or paralysis, or other serious complications. Minor complications are the ones which resolve spontaneously or require minimal management to resolve.²

The complications need to be kept in mind and looked for at every visit after implantation. The global complication rate comprised 14.9% of minor complications and 5% of major complications in one study.³

Among the major complications, the most common cause for revision surgery was device failure. This required explantation and re-implantation. The second most common cause for revision surgery was flap issue.⁴

The rate of flap necrosis in literature is reported between 0.24 and 3.8%.⁵

Flap necrosis is more common with extended postauricular incision compared to minimal retro-auricular incision.⁵ It is important to maintain the vascular feed of the flap to prevent such complications.

Skin flap complications can be minor or major. Minor complications include redness or ulcer at the coil area. Generally this can be managed by avoiding processor usage for few days and topical application of antibiotic cream. MSFCs need anything from debridement, primary closure, flap rotation, and sometimes explantation. Incidence of MSFC in literature range from 1.08 to 8.2%.⁶

Dagkiran et al. report rate of flap necrosis between 0.24 and 3.8%.⁵

In our first case, the hematoma was caused by an injury. In the second case, an abscess was noticed 2 months post switch on. The early identification was missed due to distance and covid-related lockdown.

When the device was exposed, the cover should be done at the earliest after achieving infection control locally. This requires aggressive antibiotic therapy and local debridement. It is important to counsel the patient that he may require multiple surgeries.

The incidence of infection at the cochlear implant site is 1.08–8.2%.^{7,8} Exposure of the implant occurs secondary to infection or flap necrosis. Once the implant is exposed it needs coverage with a well-vascularized tissue in treating the infection.⁹

Temporoparietal fascia flap (TPFF) is a tried and tested workhorse for salvaging an exposed implant. According to Leonhard et al., the temporoparietal fascia flap is an excellent option for reconstruction of device site soft tissue dehiscence and can prevent explantation. In their study of handling five cases of exposed device, four could be successfully covered with temporoparietal flap and only one needed explantation and reimplantation.¹⁰

Eun et al., saved two exposed implants by covering them with vascularized temporofacial myofascial flap.¹¹

Gawęcki et al. showed success in 52.6% of their exposed and infected cochlear implants by two-layer coverage consisting of inner temporalis muscle fascia flap and outer rotation skin flap. They concluded that single-layer closure with a rotation skin flap was not successful in their series.¹² However, the reach and pliability of temporalis muscle flap is limited due to its bulk and vascular pedicle being more anteriorly placed. There are case reports of successful coverage of cochlear implant with temporoparietal fascial flaps.^{13,14} The TPF flap is thin, pliable, has a rich vascular plexus, and the reach of the flap is also much more than the temporalis muscle flap.¹⁵ Hence it becomes the well-suited flap for implant coverage.

Temporoparietal fascial flap is ideal to cover the exposed implant in flap complications for the following reasons.

- It is easily available at the surgical site.
- Large donor area is available to cover a wide area also.
- The flap is well vascularized by superficial temporal artery.

- It does not leave with any visible scar as it gets covered under scalp hair.
- Morbidity is less.
- The flap can be used in primary case also for reinforcement.

CONCLUSION

Exposed cochlear implant device is an MSFC which may sometimes lead to explantation. In our experience with two cases, we have realized that the temporoparietal flap offers an excellent cover for the device. It is in the same vicinity of the device and available in abundance. The surgery should be attempted after good infection control with appropriate antibiotics.

CLINICAL SIGNIFICANCE

- Most of the cochlear implant surgeons have come across complications with either minor or major.
- The implant is very expensive and explantation leads to deprivation of the hard acquired hearing and speaking skills of the recipient.
- Every effort should be made to save the device.
- In this direction, the temporoparietal flap and skin rotation surgery offers hope to salvage the device.

ORCID

Vasanthi Anand  <https://orcid.org/0000-0002-9953-4293>

Lakshmi Shantharam  <https://orcid.org/0000-0003-2293-6056>

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